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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,393	08/18/2003	John W. Lundstrom		6127

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EXAMINER	
KRAMSKAYA, MARINA	
ART UNIT	**PAPER NUMBER**
2858	

DATE MAILED: 10/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/644,393	LUNDSTROM ET AL.	
	Examiner	Art Unit	
	Marina Kramskaya	2858	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-6 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-4 and 6 is/are rejected.

7)☒ Claim(s) 5 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The abstract of the disclosure is objected to because the abstract is more than one paragraph. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Christy et al., US 5,841,282 in view of Pullman, US 3,766,471, and in view of Cambell, US 5,479,104, and Applicant's Admitted Prior Art (from hereon AAPA).

Christy discloses a method for determining the moisture content percentage of soil using electrical means, the method comprising the steps of,

- Inserting two conducting electrodes into the soil to be measured (column 5, lines 27-30),
- exciting the electrodes with an alternating current (AC) voltage **98** (column 6, line 39),
- measuring the current through the soil (using current measuring apparatus **100**), the voltage across the excited electrodes (using voltage measuring apparatus **102 or 104)**.

Christy does not disclose the measurement of the phase relationship between the current and voltage.

Pullman discloses measuring the phase relationship between the measured current and measured voltage (column 3, lines 20-24),

It would have been obvious to one skilled in the art at the time of the invention to incorporate the phase measuring means as taught by Pullman in order to accurately calculate the impedance using well know current-voltage-phase relationships.

Christy does not disclose

- the calculation of the soil capacitance as well as the resistance,
- the computation of the best fit regression between the wet density and the soil real electrical impedance
- the computation of the best fit regression between the unit weight of water and the quotient of calculated soil electrical capacitance and soil electrical resistance
- the use of the regression equation, developed from initial calibration testing to predict the wet density and unit weight of water for the new soil locations

Cambell discloses calculating from the measured values, the equivalent soil electrical resistance and electrical capacitance (column 3-4, lines 54-3),

It would have been obvious to one skilled in the art at the time of the invention to incorporate the calculation of the electrical resistance and electrical capacitance of the soil as taught by Cambell into the teaching of Christy in order to accurately compute the moisture content as the relationship between electrical resistance /electrical capacitance and moisture levels are well known in the art.

Cambell discloses the relationships between moisture content variables and impedance values, resistance (R_s) and capacitance (C_s), are well known; therefore, it would have been obvious to compute a regression between moisture related variables and impedance (R_s and C_s). (column 1, lines 25-26).

Therefore the steps of

- computing the best fit regression between the wet density and the soil real electrical impedance as calculated from the values of AC measurement frequency, electrical resistance, and electrical capacitance,
- computing the best fit regression between the unit weight of water as determined from the physical soil measurement, and the quotient of calculated soil electrical capacitance and soil electrical resistance,

would have been obvious to one skilled in the art at the time of the invention since the relationships between moisture content variables and impedance values, resistance (R_s) and capacitance (C_s) are well known.

Cambell discloses the use the regression equation, developed from initial calibration testing to predict the wet density and unit weight of water for the new soil locations. Whereby, Cambell discloses the relationships between moisture content variables and impedance values, resistance (R_s) and capacitance (C_s), are well known; therefore, it would have been obvious to compute a regression between moisture

related variables and impedance (R_s and C_s). (column 1, lines 25-26), and further use the regression to calculate other moisture related variables.

It would have been obvious to one skilled in the art at the time of the invention to incorporate the moisture/density and electrical data relationships as taught by Cambell, in to the teachings of Christy, and compute a regression in order to have a reference for future repetition of the measurement steps.

Christy does not disclose the steps of

- performing the above steps several times on soils of differing densities and/or moisture contents is obvious to one skilled in the art as these steps can be repeated.
- repeating the electrical measurements in new locations of the same soil type that have not been tested with physical means, and
- calculating the equivalent soil electrical resistance, capacitance, and real impedance for these new locations.

However, these steps are a repetition of steps as disclosed by Christy in view of Pullman, and in view of Cambell above.

Therefore it is obvious that if the procedure can be performed once, they can be repeated. It would have been obvious to one skilled in the art at the time of the invention to repeat steps for more accurate data.

Christy does not disclose

- the use of standard geotechnical testing procedures to calculate the wet density and the unit weight of water in a test sample of each area of soil that was electrically measured, and
- the use of standard geotechnical equations to calculate the dry density and moisture content percentage from wet density and unit weight of water.

AAPA discloses in prior art

- the use of standard geotechnical testing procedures (ASTM) to calculate the wet density and the unit weight of water in a test sample of each area of soil that was electrically measured (page 4, lines 20-30), and
- the use of standard geotechnical equations to calculate the dry density and moisture content percentage from wet density and unit weight of water (page 5, lines 3-6)

Therefore, it would have been obvious to one skilled in the art at the time of the invention to incorporate use of standard geotechnical testing procedures and equations, as taught by the ASTM procedures in AAPA into Christy, in order to verify the electrically measured data.

As per Claim 2 Christy further discloses the position, placement, and/or length of the conducting electrodes is varied to change the area and depth of the electrical measurement field in the soil (column 6, lines 24-28).

As per Claim 3 Christy further discloses the number of conducting electrodes to be more than two (electrodes **64a-f**).

As per Claim 4 Christy further discloses the use of an electronic computing device **108,** which automatically performs and displays the results of the calculations, computations, regressions, and other mathematical or logical manipulations.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Christy et al., in view of Pullman, and Cambell, and Applicant's Admitted Prior Art, as applied to Claim 1 above, and further in view of Preikschat, US 3,992,665.

The method of soil testing as in Claim 1 is disclosed as above, but Christy as modified does not disclose a method for temperature correction.

Preikschat discloses a method in measuring soil where the measured electrical values are automatically corrected for differences in soil temperature with suitable means (thermal compensation means: column 3, lines 23-25).

Therefore, it would have been obvious to one skilled in the art at the time of the inventions to incorporate a temperature correction means as taught by Preikschat into the modified teachings of Christy in order to correct the measured impedance as the temperature varies (column 2, lines 23-27).

Allowable Subject Matter

7. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Anderson et al., US 6,380,745, discloses a soil moisture and density measuring device, which includes the plurality of electrodes insertable into soil, resistance measuring, and density/moisture content calculations. Konig et al., US 3,769,581, discloses a device with electrical probes insertable into the soil, with voltage, current, and phase measuring means, for calculating physical properties of soil in a computing device. Matlin, US 3,882,383, discloses a soil moisture testing device with electrodes insertable into soil, and resistance measuring means for the calculation of soil moisture content.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marina Kramskaya whose telephone number is (571)272-2146. The examiner can normally be reached on M-F 7:00-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Le can be reached on (571)272-2233. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Marina Kramskaya
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